THE GULSTONIAN LECTURES,
ON
MALIGNANT ENDOCARDITIS.
Delivered at the Royal College of Physicians of London, March, 1885.

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LECTURE I.

MR. PRESIDENT AND GENTLEMEN,—It is of use, from time to time, to take stock, so to speak, of our knowledge of a particular disease, to see exactly where we stand in regard to it, to inquire to what conclusions the accumulated facts seem to point, and to ascertain in what direction we may look for fruitful investigations in the future. With your permission, sir, I propose to do this in the case of that most interesting disease generally known as ulcerative endocarditis, a disease the phenomena of which were first clearly explained by the late Dr. Kirkes, from whose investigations in 1851-52 we date our accurate knowledge of the affection. Some of those who listen to me to-day can doubtless recall, and recall with pleasure, the Gulstonian Lectures of 1851, in which Dr. Ormerod dealt so fully and so ably with valvular affections of the heart; but a reference to them will show how much the past twenty-five years have done to widen our view of cardiac disease, more particularly in regard to the effects of emboli, and the association of valvular inflammation with grave constitutional disorder, and the probable connection of the disease with the presence of micro-organisms. By the labours of Drs. Ogle, Wilks, Simpson, Meoxon, Briantowë, and others in this country, of Charcot, Vulpian, and Lancereaux in France, and of Virchow and a host of observers in Germany, a large amount of material has been accumulated; and we may assume that the pathological, clinical, and anatomical characters of the disease have been fairly well ascertained, and that, as far as it is possible to go, towards a full knowledge of the affection as the ordinary means at our disposal will permit. The inquiry now enters upon another stage, and it remains for experimental investigation to determine, if possible, the relation of the endocarditis to those diseases with which it is most frequently associated. This being the case, the present time has seemed to me a favourable opportunity to summarise our knowledge to date; and, for this purpose, I have reviewed the records of over two hundred cases, which, from the description of the symptoms and lesions, were evidently of the type of malignant endocarditis; and these, with the considerable experience I have had at the General Hospital at Montreal, may perhaps enable me to give a somewhat more comprehensive account, in some respects, than has yet been attempted.

In discussing the subject of endocarditis, we are met at the outset by difficulties of nomenclature and classification. The designation usually employed to indicate those forms which are accompanied by proliferation of, and exudation upon, the endocardial surface, or without loss of substance, as opposed to chronic, in which there are sclerotic changes without vegetations. Subdivisions of the acute form have been arranged on an anatomical basis, as the terms plastic, papillary, verrucose, fungous, ulcerative, indicate. On the other hand, from an etiological point of view, the forms of endocarditis are as numerous as the diseases in which it occurs, and we cannot hear the expressions puerperal, rheumatic, scarring, etc. Some speak of primary and secondary forms; while, from a clinical standpoint, they are arranged in two classes, simple and grave. Anatomically, there appear to be no very essential differences in the various forms of endocarditis, and the small capillary exudation and the huge fungating vegetation with destructive changes, all gradations can be traced, and the last may be the direct outcome of the first; the two extremes, indeed, may be present in the same valve. They represent different degrees of intensity of one and the same process. A classification of cases, based on the ordinary macroscopic characters of the inflammatory products, into watery or verrucose and ulcerative, will, in many instances, group together cases widely different in their clinical aspects; and, contrariwise, a clinical subdivision into cases of simple and cases of malignant endocarditis by no means of necessity implies that the lesions in the former case are plastic or warty, and in the latter the ulcerative or destructive. The term ulcerative has come into very general use to describe the grave form, and it expresses well an anatomical feature present in a large proportion of cases; but in others it is very inapplicable, as there may be no actual loss of substance, and no more destruction than occurs in the verrucose form; and, on the other hand, there may be great destruction and ulceration from causes of an entirely different nature. The numerous other terms employed—septic, infective, diathetic, rheumatic, and others, when employing some special feature, and so far suitable, have never come into very general use. On the whole, it seems to me that the names simple and malignant, which we use often to separate the milder and severe forms of many diseases, might appropriately be employed, so far as the endocarditis is concerned: the simple being those with few or slight symptoms, and which run a favourable course; the malignant, the cases with severe constitutional disturbance and extensive valve-lesions, whether ulcerative or vegetative, the term being more clinical than anatomical.

Malignant endocarditis occurs under the following conditions: 1, as a primary disease of the lining membrane of the heart, or as its valves, either attacking persons in previous good health, or more often attacking the debilitated and dissipated, or those with old valve-lesions; 2, as a secondary affection in connection with many diseases, particularly rheumatic fever, pneumonia, scarlet fever, diphtheria, ague, etc.; 3, it may follow suppuration of specific nature; 4, as an ulcerative process, traumatic or puerperal. We shall discuss first the anatomical characters, then the clinical features, and lastly the etiological and pathological relations.

The lesions of malignant endocarditis are by no means uniform, and may be vegetative, ulcerative, or suppurative; and those various forms may occur alone or in combination. The belief that there is always ulcerative lesions in some cases have been recognised. Among these there are cases with the clinical history of the malignant form in which, however, nortem, the valvular condition has been that of a severe vegetative or verrucose endocarditis. Such a case was a lad aged 11, a patient of Dr. Molson's, from whom I obtained the specimen which I pass round. He had chorea in July 1880, the second attack. Rapid improvement and recovery under Mr. Walter's solution, five minims every four hours, hypodermically, took place. There was a slight mumurish condition of the first sound. When seen again on March 3rd, 1881, the chorea had returned, having begun ten days before. The patient improved until the 10th, when he began to be feverish; had exacerbations each evening; the temperature rising hyperthermically, took place. There was slight paresis of the left side, and death took place on the 10th. The temperature on the 15th was nearly 106°. There were irregular, soft, greyish-white vegetations on the mitral valve, infects in the spleen and kidneys, and a small spot of red softening in the right corpus striatum. These photographs from a case of Dr. Musser's illustrate a more advanced condition of the same kind; the vegetations were larger, more abundant, and some were a little irregular and soft on the surface, but, unless a mass were removed, no actual loss of substance was seen. Even in the smallest vegetation there is some destruction of endocardial tissue, if only of the endothelium and superficial layer; while the larger outgrowths are more deeply set in the valve-ends or commissures of the valve. Without vegetation, there is ulceration, the frequency of the occurrence of which has given the name most often attached to this form of endocarditis. The loss of substance may be superficial, involving only the endocardium, or it may be deep and destructive, leading to perforation of a valve, of the septum, or of the heart itself. On the valves, extensive outgrowths usually accompany the process, and may conceal the ulcer or project as fungating masses from its edge, as is well illustrated by this coloured drawing. In many instances, the process appears simply ulcerative, without any vegetations to speak of. In the slightest form, only a superficial abrasion exists, perhaps seen in some cases of simple endocarditis. If we consider the ulceration occurs in the condition in which by which half a valve may be destroyed, or there may be (as shown in this drawing) a deep excavation extending beyond the valves, and destroying the muscle-substance of the heart, leading to perforation of the septum or of the wall of the ventricle. These are well known features, however, upon which I need not dwell. In two instances, I observed superficial necrotic changes without ulceration, either outgrowths, circumscribed patches, of the size of a sixpence, opaque yellow-white in colour, resembling the necrotic pleurs, over a pyemic infarct of the lung, or a portion of dead peritoneum at the base of a deep typhoid ulcer. Doubtless, these would in time have formed ulcer. I find this without ulceration in one or two cases. Lastly, the process may be suppurative, in which case the deeper tissues of the valve appear first involved, and the endocardium only implicated by contiguity. The occurrence of small abscesses at the base of extensive vegetations is not uncommon, but there are also instances in which the suppuration seems to follow the initial step. The combination of ulcerative and fungating
outgrowths is, perhaps, the most common condition. The vegetations vary a good deal in appearance and consistence. Soft greyish-white, or roughened, bony surfaces covered with thin, white, rubbly, dot adheres, are numerous; or there may be large cauliflower-excrescences, with deep jagged fissures; or, again, long, pendulous, stellate,
tissue masses. In the latter form, we often see, as Dr. Moxon pointed
out, the effects of friction, and such a long vegetation from an aortic
 cusps may produce, by contact, a whole series of smaller outgrowths
 along the ventricular wall. The pressure of the valves against each
 other, and the natural rotatory movement of the heart, produces
 mass UIP, and one can sometimes see where masses have been torn off,
either entire or by a gradual process of disintegration. Considering
 the force with which the valves come together, it is curious that
 the soft vegetations, occupying, as they generally do, the
 planes of closure, can resist the constant compression to which they
 are submitted. The vegetables situated throughout the thick, grey
 or greenish-yellow colour. Changes in a conservative direction
 may go on when the disease is much prolonged. Fibroid induration
 may take place in the deeper parts, while the superficial portions
 remain unchanged and necrotic, perhaps also becoming a little harder
 and shrinking. Such a process can be seen in this specimen of endo-
carditis from an ox, in which there were most extensive vegetative
 and destructive changes. Not unfrequently the vegetables are gritty,
 from the deposit of lime-salts, which may take place in very acute
 cases, and is not necessarily an indication of age. It is interesting to
 note how often inorganic material is deposited in the neighbourhood
 of micro-organisms, as here on the endocardial outgrowths, in the
 tonsillar crypts, and about the tufts of actino-mycetes. Two conditions
 noted are distinguished: (1) a distinct mycotic endocarditis, which
 resembles the atheromatous degeneration in sclerotic valves, which
 leads to ulceration and extensive destructive segments, a process
 which has nothing in common, except in its effects upon the valves,
 with the acute ulcerative changes above described, but is similar to
 the atheromatous processes in the aorta. It must not be for-
gotten, however, that an acute mycotic process may be engrafted,
 and indeed, often is, upon old sclerotic valves, the seat of athero-
 matous changes. The firm white globular thromb of the auricular
 appendices, and of the interstices of the columnae carneae of the ventricles,
 have sometimes an appearance closely resembling endocardial out-
growths, and when softened in the centre and ruptured, the
 resemblance may be very close indeed. It is possible that the granular
 dots of an atheromatous abscess or a softened thrombus may possess
 irritating properties when discharged into the blood.

Histological Characters.—The study of a small fresh endocardial
 vegetation shows it to be made up of cells derived from the sub-
endothelial layer, round and fusiform, which, by their proliferation,
 have produced a small nodular projection on the surface of the endo-
cardium (Fig. 6). Varying with the rapidity of the growth, the mass will
 present one of several aspects. Obstructive infiltration of fibrous
 tissue, necrotic, or tuberculous, is the commonest. The soft, greyish-
 white or greenish-yellow mass, though not involving the blood-
 plate, is often seen as a deposit upon a cusp of fibrous tissue, at times
 superimposed upon it in a cap of fibrous tissue of an organ, and at other
 times straining the material, of variable thickness. Though this resembles an ordinary
 exudative coagulation, it is probably deposited directly from the blood,
 and is of the nature of a thrombus. Upon and in this layer may be
 found, sometimes in large numbers, those remarkable little bodies
 which have long been known, when collected together, as Schultze's
 granules. It seems probable that these later become prominent as the
 blood-plates of Bizzozero and the hematoblast. In the same way,
 usually, they are very abundant; and I have seen soft watery vegetations
 composed (superficially) in great part of them. As their connection
 with endocardial and endarterial outgrowths has not, so far as I
 know, been referred to, I may be permitted to call attention to these
 two drawings, which further illustrate this point. The first repre-
sents the auricle from which the contained blood was pressed out,
in which, just above the bifurcation, three irregular masses are shown,
 each about 1 inch in length, which projected fully a quarter of an inch from
 the inner surface of the vessel. They were attached to atheromatous ulcers,
 were soft greyish-white in colour, and were composed exclusively of
 the elements of Schultze's granule-masses, with fibrinous-fibril, and
 here and there some lymphoid cells. The second drawing illus-
 rates a small aneurysm of the aorta, which, through the wall of
 the oesophagus. On the wall of the sac, the artist has represented a
 number of irregular whitish lines, which were narrow elevated ridges,
 also made up microscopically of these small discoid elements, the con-
nection of which with fibrina-formation has been strongly insisted
 upon by Bizzozero. Scattered in and beneath the fibrous exudation
 were numerous small rounded bodies, which have the appearance and
 reaction of micrococci.

The larger vegetations, more characteristic of malignant endo-
carditis, consist of a granular material composed of altered and dead
 tissue-elements, fibrous, exudation, and colonies of micrococci; the
deeper parts present the appearance of a granulation-tissue, while, at the
attachment in the valve, there is either more or less infiltration and
degeneration of the cell-elements. The granular substance is structureless,
and resembles diphtheritic exudation, the resemblance sometimes
being so close that one can readily understand the application of the
term "diphtheritic" to the inflammation. It may be distinctly
laminated, and, with a high power, fine filaments can be seen,
though usually the granules conceal all appearance of structure.
Small colonies of micrococci are sometimes found throughout the
masses, as if portions had undergone a sort of hyaline transformation.
In the instances, this is very marked. Pale spheres filled with granules also
occur, and may be very abundant. They have been described as
colonies of micrococci; but some regard them as altered endothelial
elements. I have seen them too numerous to be explained on this
view. At the attachment of the vegetation, there is a zone of tissue
deeply infiltrated with leucocytes, and deeper still the tissue-elements
of the valve present an increase of nuclei and cells. The destruction
of tissue appears to result in two ways: first, a gradual exten-
sion inwards of the necrotic process, doubtless induced by the
micrococci; secondly, the softening and separation of valve-tissue
caused by the rapid development of leucocytes at the base of the
vegetation.

The micrococci are constant elements in the vegetations. All
granules of an uniform size met with in the sections are not
micro-organisms, nor, indeed, are all which stain by some methods
recommended for the detection of these bodies. By far the most satis-
factory method is that of Gramm (Fortschritte der Medizin, Band i,
Berlin), in which the section, after staining in gentian-violet, is trans-
fixed for a few minutes to a dilute solution of iodine and iodide of
potassium, and then to the alcohol, when it is found that the colour
has been extracted from all tissue-elements and nuclei, leaving only
the micro-organisms stained. They vary a good deal in number and
arrangement, and may be scattered singly in the granular substance
or arranged in groups. They are usually very numerous at the deeper
part of the valves, and on the structures as minute as the granula-
lation-tissue, and they may penetrate deeply into the substance of
the valve. Sometimes the smaller vegetations seem made up ex-
clusively of them. Several of my specimens appear to confirm the
view of Klebs (Archiv für Experiment. Pathologie, Band vi), that the
micrococci lodge first on the endocardium, and penetrate into the
substance, often as distinct columns. In their immediate vicinity, there
is a more or less infiltration of leucocytes, and the usual signs of reactive
inflammation. The micro-organisms found in con-
nection with the malignant endocarditis are not all of the same kind.
Klebs distinguishes two forms, one met with in septic, and the other
in rheumatic, cases. In some instances, the micrococci are all arranged
in zoogloa-like masses; in others, particularly the septic cases, they
are in chaplets. Some present distinct capsules. Small elongated
bacilli have also been found; I have seen them in one instance, short
stout rods, often joined in pairs. Delafield and Prudden (Text-book of
Pathological Histology, New York, 1885) have recently noted the
presence of bacilli in the vegetations of a very acute case of malignant
endocarditis. Cornil, in a recent lecture (L'Abcille Médicale, No. 51,
1884), stated that the bacillus tubercolosis had been found in the vegeta-
tions on the valves in cases of phthisis, and expressed the opinion
that this constitutes a further evidence of the knowledge of the
horizontal way in which the micro-organisms in endocarditis depend on the nature of
the primary disease. By culture-experiments alone can we hope to have the
question settled.

The following figures give an approximate estimate of frequency with
which different parts of the heart are affected. The aortic and mitral
valves are most frequently affected together in 41 cases, the aortic valves alone in 55,
the mitral alone in 42, the pulmonic alone in 15, and the heart-wall in 33. The right heart is rarely affected alone;
this occurred in only 9 instances, in 5 of which the tricuspid, and in
4 the pulmonic, valves were involved. The valves are most often
attacked along the lines of closure, as in the simple endocarditis;
the auricular faces of the mitral flaps, and the ventricular surfaces
of the pulmonic leaflets, being most affected. Mitral endocarditis is
often seen at the upper part of the septum of the left ventricle, just
below the aortic ring, in which situation some of the most extensive
and deep cardiac ulcers occur, leading to perforation of the septum.
is, in the majority of cases, secondary. Thus, in the endocarditis of septic processes, there is the local lesion, a suppurring wound, a suppuration, or purpural processes of a septic nature. In a very considerable proportion of cases, it is evidence of recent pneumonia; in others, rheumatic affections of joints, the diphtheritic processes. In the group of primary cases, the lesions are entirely those of endocarditis, local and general. In the second place, there are the extensive pathological changes due to embolism; and these constitute interesting features in the disease, and may produce a very remarkable variety of lesions in every portion of the body. I do not propose to deal very fully with these, but to call attention only to some special points. The cases may be divided into two classes; in one, any embolic processes, cases in which the infarcts are simple, not suppurative, those in which there are innumerable supplicative infarcts and cases in which some of the infarcts are simple and some supplicative. It is remarkable how variable these embolic features are. They are entirely absent in well-marked malignant cases. They are not necessary in the case of endocarditis; indeed, in a very considerable number of cases, they present the characters of fibrinous hemorrhagic infarcts, but in the traumatic and purpural cases the infarcts are invariably suppurative. They may be few in number, only one or two, perhaps in the spleen or kidney, or they may be in thousands throughout the various organs of the body. When supplicative, micrococci, whose experience, are always present; but the micrococci, indeed, may exist in the absence of all evidence of this change. In severe forms of the disease, hemorrhages are very frequent, in the spleen, and on the serous and mucous surfaces. The cutaneous ones will be referred to again in connection with the symptomatology. They appear, in many instances, to be due to the effect of the poison, just as in other infectious diseases; in others, they are undoubtedly embolic, and a minute necrosis. A superficial purpuric centre sometimes be seen. In the membranes of the heart, there may be extensive superficial extravasation. Litten (Charl. Annalen, Band iii), Berth, has called attention to the frequency of retinal hemorrhages, particularly in the endocarditis of purpural sepsis. In some instances, there are innumerable muscular abscesses, more particularly in the heart and kidneys. They are often associated with hemorrhage, and the smaller ones look like very little extravasations, but the presence of micrococci and suppuration can be easily seen by microscopic sections. The spleen is most often the seat of infarction, and next in order the kidneys. The lungs are usually affected when the endocarditis is on the right side, and may be suppuration or even extensive gangrene, but even with destructive lesions of the pulmonary valves there may be no supplicative infarcts in the lungs, as in a case of Dr. Church (Pathological Society's Transactions, xxvi). Or again, as in a case of Dr. Moxon's (Lancet, 1884, vol. ii), there may be with aortic valvulitis supplicative infarcts in the lungs and other organs. The gastro-intestinal canal may present very remarkable changes, due to the presence of numerous infarctions, from the size of a pin's head to that of a split pea. They are slightly elevated, greyish-yellow in colour, often surrounded by a zone of deep congestions or extravasation, and on section may show a supplicative centre. Micrococci are present, as in other cases of abscesses, and in several instances I was able to find small embolic infarctions in various organs, such as the submaxillary. The abscesses may, as in a case of Dr. Church, leave a small ulcerated scar. The stomach may infarct small minute infarcts, and occasionally larger ones. Carrington (Lancet, 1884, vol. i), has described a remarkable case in which there was a gastric ulcer, apparently due to embolic process, in a case of severe endocarditis; and Magill (British Medical Journal, 1884, vol. ii), a case in which the stomach was intensely inflamed and necrosed, and the greater curvature being black, almost gangrenous. The liver may present a minute infarction in a number of cases in which there has been jaundice degeneration of the cells has been observed (Schnitzler, Wiener Med. Fasce, 1865). The serous surfaces are often inflamed, pleurisy and pericarditis being not uncommon complications. The pericardium is most frequently affected in rheumatic cases, in which endocarditis and pericarditis may occur together. Pleurisy is met with chiefly in connection with the traumatic and purpural processes of a septic nature, which, as I shall show, plays an important part in the history of this form of endocarditis. The cerebral lesions are of the substance and of the membranes. Embolic softening, simple or supplicative, is extremely common, and in many cases head-symptoms supervene, and there is paralysis of one side or the other. There may be a single embolus, producing extensive suppuration or red softening, or there may be multiple emboli in various parts of the brain. The meningial complication of endocarditis has not received much attention. The frequency with which it has occurred in the Montreal cases, fifty instances out of twenty-three, I was quite prepared to find such a large
Lectures

On

The Anatomy of the Intestinal Canal and Peritoneum in Man.

Delivered at the Royal College of Surgeons of England.

By Frederick Treves, F.R.C.S.,

Hunterian Professor at the Royal College of Surgeons; Surgeon to, and Lecturer on Anatomy at, the London Hospital.

Lecture II.

The Mesentery.—The mesentery, so far as its intestinal attachment is concerned, extends, it is needless to say, from the end of the duodenum to the ileo-cecal junction. Its upper or right layer is continuous with the under layer of the transverse mesocolon, and with the peritoneum that invests the ascending colon. Its lower or left layer joins with the serous membrane that invests the colon, that forms the sigmoid mesentery, and that descends over the lumbar-sacral eminence into the pelvis. The parietal attachment of the mesentery is liable to considerable variation, and cannot be so readily disposed of. The point at which this attachment commences above is practically constant. It corresponds with the ending of the duodenum, is about on a level with the lower border of the pancreas, and is just to the left of the vertebral bodies. From this point the insertion of the mesentery follows an oblique line that runs downwards and to the right, crossing the greater vessels, and then ending in a somewhat uncertain manner in some part of the iliac fossa. This precise manner of its ending will be dealt with subsequently. In an ordinary case, if the mesentery be divided close to the bowel, and all the small intestine be removed, the membrane will appear as a well-marked fold, arising by a narrow line from the posterior parietes, and deviating not very considerably from the middle line. It is important to recognise that this attachment does not represent the real root of the mesentery, nor is it any part of the attachment of the median vertical fold of peritoneum, that went to the primary intestinal loop. The real root of the mesentery is in the interval between the transverse colon and the duodenum, where the trunk of the superior mesenteric artery enters.

The lower part of the primary vertical fold is represented by the serous attachments of the descending colon to the parietes. The long line of insertion of the mesentery in the adult is entirely a secondary or acquired attachment. I might recall the fact that there is a time in the history of the development of the intestine when the small intestine, the ascending colon, and the right half of the transverse colon, as form part of a single simple loop, enclosed in a single fold of peritoneum, which is attached to the vertebrae, and has its root in the comparative narrow interval between the transverse colon and the duodenum. At such a time, the parts of the colon named and the small intestine have a mesentery in common. When the rotation of the bowel takes place as already described, when the colon crosses over the duodenum so as to reach the right hypochondriac region, this common mesenteric fold is rotated to the extent of half a circle. Thus it is that what was once the left and under layer of the common mesentery becomes the right and upper layer of the mesentery of the adult, and vice versa.

The line of the ascending colon descends to reach its final resting-place in the right iliac fossa. As it progresses it outgrows its serous covering, and in time the ascending colon above it acquires a non-peritoneal surface. This part of the large intestine is no longer a part of a free loop, and what is now the permanent mesentery may appear for a while to come off from the parietes, along the inner border of the now attached ascending colon. As a result of further development, the line of origin of the mesentery is moved nearer to the middle line, until it comes to occupy the position that is familiar in the adult. As a matter of fact, the insertion of the permanent mesentery appears before the point of insertion, and it may be seen as a separate fold attached to the spine in the fetus, when the cecum still occupies the right hypochondrium (Fig. 8 b). While the cecum is in this position, the line of attachment of the mesentery, such as it is, appears to be almost transverse, and it may not attain its permanent oblique direction until the cecum has ascended to reach the iliac fossa.

In a large number of the mammals, the ascending colon never loses any part of its original complete serous investment. It never, therefore, becomes attached to the parietes, but remains as a part of the great loop of intestine, and still invested in a simple mesentery that is common to it and the whole of the jejuno-ileum. In such animals the right iliac fossa is large bowel remains singularly free; the mesentery of the small intestine retains its primitive relations; it acquires no secondary attachment to the parietes, and its sole root and attachment is in the narrow gap between the transverse colon and the duodenum. This condition is occasionally met with in the human subject. The ascending colon is entirely free up to the hepatic flexure, and is invested by a mesentery, common to it and the small intestine. I have met with two examples of this in one hundred specimens. The condition is of interest pathologically, as favouring the development of a certain form of volvulus of the cecum and small intestine.

Putting aside this condition, it may be said that the parietal attachment of the mesentery measures, as a rule, about 6 inches; its mode of ending at its inferior extremity is as follows. When an ascending meso-colon exists, the mesentery ends by joining it. The two membranes meet at an angle, often at a right angle, and then the right layer of the mesentery becomes continuous with the left layer of the ascending meso-colon, and the left layer of the mesentery with the right one of the coils of the intestine. When no meso-colon exists, the peritoneum that covers the cecum is reflected from the hinder surface of that part of the bowel on to the posterior parietes; at this reflection the mesentery ends. Its left layer is continuous, and often in a line, with this reflected membrane, and then passes on into the pelvis, while its right layer is continued on to the ascending colon. As the position of this reflection varies considerably, so the length of the parietal attachment of the mesentery must be varied in proportion, and the same applies to cases where an ascending meso-colon exists.

The length of the mesentery from the spine to the intestine varies in different parts of the canal; its average length may be taken as between 8 and 9 inches. It soon attains its full length, and within one foot of the end of the duodenum is already 6 inches in length. The longest part of the mesentery is that which goes to the coils of intestine that lie between a point 6 feet from the duodenum, and a point 11 feet from the same part of the gut. Such coils will, therefore, include 5 feet of the intestine, and the mesentery here not infrequently reaches the length of 10 inches. This point is of interest in connection with the position of certain coils of intestine, and to the subject of volvulus; all will be seen later.

The important part that the mesentery must play in connection with the common forms of hernia has, it would appear, been somewhat overlooked. If the fresh body of an adult be opened, and the condition of the viscera and peritoneum be normal, it will be found that it is impossible to drag a loop of small intestine through the femoral canal (accessorily enlarged) on to the thigh, or down the in-
side, or fairly braing inland, places, is often important during the convalescence from these diseases, but the fatigue of long journeys is to be avoided.

Preventive medicine has a very large field in the subject of phthisis. I need only remind you of the change in the mortality from phthisis of soldiers and prisoners by improved ventilation in barracks and prisons, and we must always have before our minds the important discovery of Bowditch and Buchanan, that drying of the soil by drainage diminishes the mortality from phthisis. The practical application requires no words.

THE GULSTONIAN LECTURES,
ON MALIGNANT ENDOCARDITIS.
Delivered at the Royal College of Physicians of London, March, 1886.

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LECTURE II.

Symptoms.—In considering the symptoms of endocarditis, it is important to bear in mind the manifold conditions under which the disease may develop. A limited number of cases may be grouped together as forming a primary substantive disease; but in the great majority the affection is either an associated pathological state, or is of the nature of a secondary malady arising in the course of some other disease.

In the primary cases, individuals in perfect health may be attacked, or, more frequently, the disease affects those with chronic valvular endocarditis, with perfect or failing compensation. Where the affection occurs after an injury, or in the puerperal state, the cardiac condition must be regarded as part of the general sepsis, and is of the same nature as the pyemic fact and the inflammation of seous membra nes. The existence of the endocarditis in these cases has no special influence, and the phenomena may be just as marked without it.

When the endocarditis supervenes in the course of some particular disease, as rheumatism or pneumonia, it is usually a secondary process, though indeed it may be regarded as directly produced by the causes which have excited the original diseases.

The different modes of onset, and the extraordinary diversity of symptoms which may arise, render it very difficult to present a satisfactory clinical picture. The general symptoms are those of a febrile affection of variable intensity, which may be ushered in, like any acute fever, with rigors, pain in the back, vomiting, headache, etc. Arising in the course of some other disease, there may be simply an intensification of the fever, or a change in its features. The pyrexia is constant, but variable in type and intensity, and more likely than any other symptom to lead to misinterpretation. Prostration of strength, delirium, sweating, and other signs of severe constitutional disturbance, are usually present.

Cardiac symptoms may be marked from the outset; pain, palpitation, sense of distress, and murmur; in many instances, there has been old valvular disease, but in a considerable number of cases the heart-symptoms remain in the background, hidden by the general condition, and giving no indication; or they may be so slight, that they are not even detected on special examination.

The embolic processes give a special prominence to local symptoms, which may divert attention from the general malady. Thus delirium, coma, or paralysis may arise from implication of the brain or its membranes; pain in the side and local peritonitis from involvement of the spleen, bloody urine and pain in the back from affection of the kidneys; loss of vision from retinal hemorrhages; and suppuration in various organs, or gangrene, from the distribution of emboli.

So diverse are the features of malignant endocarditis, that a consideration of the symptoms is greatly facilitated by arranging the cases in groups, according as they display special characters. Dr. Kirke, in 1832, called the attention of the profession to the occurrence of a typhoid-like condition in acute endocarditis, and he emphatically pointed out the fact that inflammation of the valves might lead to pyemia. The investigations of Charcot and Vulpian (Gazette Médicale de Paris, 1862), of Virchow (Gesammelte Abhandlungen), of Jaccoud (Nouveau Dictionnaire de Médecine, etc., art. Endocarditis), and others, gradually led to the recognition of these two great types of the disease. Of late, still further elaboration has been made of the cases with acute phthisic ague or intermittent fever, and also of cases in which the cardiac symptoms are most prominent; and I shall call attention to certain cases in which the symptoms are those of an acute affection of the cerebro-spinal system.

And first let me direct your attention for a few moments to those cases in which the endocarditis is merely a part of a septic or pyemic state, the result of an external process, or of a primary septic process, or of an acute necrosis. Somewhat over 18 per cent. of the cases I have analysed were of this nature, the majority of them occurring in connection with puerperal fever, 11 per cent.; the others in association with various wounds and injuries, or acute necrosis of bone. The puerperal cases appear most frequent after abortion, and the first symptoms usually develop within a week or ten days of delivery, beginning with rigors and fever, and running a course not essentially different from ordinary puerperal septicemia or pyemia without endocardial complication. Sometimes, the onset of the symptoms may be much delayed, and the patient up and about her duties when the attack comes on. Usually, there is local inflammation of the uterus or ligaments; membranous-diphthoric-endocarditis, and phthisis, are common. Occasionally, there may be some special affection of the generative organs, as in very severe cases reported by Dr. Moxon (Pathological Society's Transactions, xxii), in which there was extensive endocarditis of the right heart, and sloughing patches in the lungs. The woman had been delivered within the month, and the uterus appeared in a state normal for the period. The endocardial lesions are not necessarily ulcerative, but may be vegetative, and occasionally supplicative. It is very evident, from the records, that valves with athero changes are most often affected. The visceral lesions are always supplicative, but do not appear to be more numerous than in cases of puerperal septicemia without endocarditis. The heart-symptoms may be completely masked by the general condition, and the attention may be directed to them only by the occurrence of embolism. In this connection, it may be remarked that malignant endocarditis may attack the umbilical vessels, and run a rapid course leading to abortion. In two cases of this kind, Litten (Charité Annalen, Band iii, Berlin) found no differences in the clinical features or anatomical condition, as regards valves and metastases. In other instances, there may be the rigors, sweats, and irregular fever, leading to abortion, without the occurrence of any supplicative focus, as in a case reported by Guyot (Bulletin de Soc. d'Anatomie, 1879). Dr. Trueman, of Maccan, New Brunswick, has also sent me notes of a case which developed during pregnancy.

The cases of ulcerative endocarditis in traumatic and operative septicaemia are of a similar nature, but do not appear to occur so frequently as in the puerperal condition. Many of the cases occur after very slight injuries, as periarticular, or the pustule of a sound through a stricture. There are usually supplicative infarcts in the lungs; and, even with extensive ulcerative changes in the left heart, the pyemic focus may be all in connection with venous system and right heart. This was well illustrated in the case of a man, aged 25, who was admitted to the Montreal General Hospital, May 31st, with a wound of the radial artery. Phlebitis followed, and calilulitis of the arm, perigal septic pneumonia, thrombosis of the femoral vein, and symptoms of pyemia. At the necropsy, there were numerous foci in the lungs, and a suppurring thrombus in the femoral vein. The mitral valve presented, on the ventricular face of the anterior segment, a patch, of the size of a sixpence, swollen and greyish white in colour, and opposite to it, on the auricular face, was an ulcer about the size of a sixpence, which carried the whole wall of the left auricle. There were no infarcts in the arterial system. In these cases of puerperal and traumatic septicaemia, the right heart is more frequently affected than in any other group of cases. Thus, of the thirty-seven cases of this kind, there were thirteen in which the tricuspid or pulmonary valves were involved.

In the acute necrosis of bone or acute osteo-myelitis, a secondary endocarditis is easily produced by simple pressure or process. In these instances the clinical features may strongly resemble malignant endocarditis, as was well illustrated in the case of a lad, aged 10, who died after an illness of less than a week's duration, characterised by high fever, rigors, sweats, etc. No local trouble was complained of, and at the post mortem examination there was ulcerative endocarditis of the right side, and a parulent focus in the septum; and it was only after most careful search that the primary trouble was found, in a small spot of acute necrosis of the tibia.
These forms do not strictly come within the province of the physician, but they must be taken into account in any description of malignant endocarditis. The source of the poison is very evident, in the external wound; the metritis, etc., and the lesions, are chiefly in the territory of the right heart, which we have described.

In the pyemic group of cases, the clinical features are of a decided pyemic type, and here the source of infection is at the heart, and the metastatic lesions are chiefly in the territory of the arterial system, rendering very applicable the name of arterial pyemia given by Dr. Wilks to this class of cases. We may recognize two types of the pyemic form: first, the cases in which the lesions are of those of ordinary pyemia, with rigors at intervals, sweats, and other signs of septic infection; and, secondly, an important group, in which intermittent pyrexia is a striking feature, occurring in regular paroxysms like ague, with cold, hot, and sweating stages. These forms may develop as primary independent affections, or come on in the course of rheumatic fever, pneumonia, etc. In our Montreal cases, they have not been so marked as the typhoid type. The following case, with illustrative chart, is a fair example of pyemic symptoms due to endocarditis developing in the course of pneumonia.

M. W., aged 43, a well built man, was admitted under Dr. Ross, February 26th, 1850. He served his time in the army; he had had syphilis, and had quite recently had syphilitic ulcers; he had also been a hard drinker. In October 1879, he was in hospital with pneumonia, and had severe cerebral symptoms. On February 23rd, he had a severe rigor, followed by fever, cough, and pain in the side. On admision, February 26th, there were signs of consolidation at the left base. On the 28th, he was delirious. On March 1st, the crisis seemed to take place; temperature fell to 98°, remained low for three days, and he seemed to be doing very well. At 1 P.M. on the 4th, he had a severe chill, with vomiting and following delirium; he had another severe chill at 2 P.M., in which the temperature rose to nearly 104°. He had five stools; there were no indications pointing to the heart. On the 6th, the morning temperature was normal; the patient was very prostrate, sweated a great deal, and there was low wandering delirium. From the 6th to the 9th, the temperature rose to a degree each evening, reaching 105.5°, its highest point. Pulse over 130, and feeble. From this time until the 14th, he gradually sank, remaining unconscious. The lung-symptoms did not extend, but rather improved. The post mortem examination revealed extensive ulcerative vegetations on the aortic valves, purulent meningitis, and resolving pneumonia of the base of the left lung.

The attack may be ushered in with a single rigor, or more often a series of chills; and from the outset they may constitute a marked feature, and, with the sweating, prostration, and diarrhoea, give a septic character to the case. A light jaundice may develop, and, still further intensify the resemblance. Sometimes the case may run on for a couple of weeks with marked typhoid symptoms, and then, pyemic features develop—rigors, sweats, etc.

But by far the most remarkable cases of the pyemic group are those which present a marked intermittent type of pyrexia, simulating a quotidian or tertian ague. They may occur without any signs or indications of heart-disease, or the symptoms may develop in individuals the subjects of chronic valvulitis. The cases are not nearly so frequent as those of the typhoid type; but they have been specially studied by Dr. Wilks, Bristowe, and Coupland in this country, Lanneaerts in France, Leyden and others in Germany. The paroxysms may have the absolutely typical features of intermittent: the chills, hot stage, and sweating succeeding each other with regularity; and in the intervals there may be an entire absence of the fever. The quotidian type is the most common; the tertian has occasionally been described; and in rare instances two paroxysms have occurred within the twenty-four hours. Those of this kind have lasted for months. In a remarkable case (Dr. Ray) described by Dr. Wilks (Med. Times Times and Gazette, 1882, vol. ii.), the patient, during a six or seven weeks' illness, rigors occurred with such regularity that a tertian ague was suspected for a time, although the patient was known to be the subject of heart-disease. In some instances, the existence of ague previously has rendered the condition much more puzzling. In several of Lanneaerts' cases (Gazette de Medicines, 1862, this gazette, 1879), this group of intermittent fever a short time before was also well one of Leyden's cases (Zeitschrift fur Klin, Med., Bd. iv, Berlin). But the most extraordinary case of the kind is recorded by Dr. Bristowe (Bristowe, Med.-Jur., 1881). A patient had ague in October; while once or twice a day; she was ill for six weeks; and, after an interval of two or three weeks, they recurred in the second week of December, and continued until December 32nd. She was well for a few days, and then the attacks recurred after sleeping in a cold bed, and persisted until her admission to hospital on February 12th. For the four weeks previous to entrance, the attacks came every twelve hours regularly; a murmur was noticed; but the history of ague was so clear, and the attacks so characteristic, that a suspicion of malignant endocarditis was at first not entertained. It was only after the failure of quinine and a variation in the character of the paroxysms that a diagnosis was reached. In Dr. Coupland's cases (Med. Times Times and Gazette, 1882, vol. i.), the intermittent pyrexia was also well marked. In none of our Montreal cases was the aguish type very pronounced, though in one or two cases there were regularly recurring paroxysms of chills, fever, and sweating; but the conditions under which the attacks developed rendered the clinical features more like ordinary pyemia. The majority of these cases appear to arise independently of other affections, and occur among those who have been referred to as the primary class of cases: though, as already mentioned, some develop in chronic valvar disease, and others appear associated in some way with ague.

The typhoid type is by far the most common, and the majority of the cases present features which come under this heading. The disease may set in with a single rigor or a series of chills, most frequently the former; often a period of malaise or ill health has preceded the attack, and in very many instances the symptoms develop in the course of some fever. The characters of this form are irregular temperature, early prostration, and involvement of the nervous system, delirium, somnolence, and coma, dry tongue, relaxed bowels, sweats, petechial and other rashes, and occasionally parotitis. Perhaps the majority of cases mistaken for typhoid, as the heart-symptoms may never be prominent, or even when sought for not found.

The following cases illustrate the chief features of this form.

Ann O., aged 46, a large well nourished woman, was admitted under Dr. Wilkins, June 5th, 1881. She had been a healthy woman. Dr. Blackader saw her on the 2nd, when she complained of severe pains in the back, loins, and hips, which were relieved by poultices. Pulse rapid, tongue furred, no diarrhoea. She was supposed to be suffering from typhoid fever. No reliable history, family or personal, could be obtained; but she had been out of sorts for four or five days previous to the onset of the attack. On admission, temperature 104°; pulse 110; respiration 32; no eruption; lungs normal; no heart-murmur; no albumin in urine. On the 6th, she passed a restless night. Temperature 104°; pulse 120, diastolic; abdomen distended; two stools. She passed 18 oz. of urine, slightly bloody, which might have been from the menesc, which began to day. On 7th, morning temperature 102°;
pulse weak, 120; respiration 54, shallow; loud sonorous râles over chest; bowels and bladder emptied involutionally; stools frequent, high coloured; patient could not be roused. The legs and general surface seemed tender, which caused her to cry out when moved. Urine drawn off by catheter contained much blood, 50 per cent. by volume of albumen, and many colourless casts, and the consistency of the urine was still fat and turbid. The right. Some rigidity of muscles of arms, most marked on the left; increasing coma, and death at 3:30 p.m. of the 7th, the sixth day of her serious illness. At necropsy, no hypertrophy of heart; mitral valves a triple thick, with small superficial losses of substance on both cusps. Aortic valves normal; infarcts in spleen. Numerous small haemorrhages, chiefly on the kidneys, were a striking feature. Eight suppurating infarcts in brain, chiefly near longitudinal fissure and on median surfaces. The case is a good example of the primary malignant endocarditis occurring in a healthy individual, and running a rapid course, with symptoms of a typhoid character. The diaphragm was not profuse, though the intestinal lesions were well marked.

In the following instance, occurring in connection with pneumonia, the profuse diaphoresis and severe nervous prostration were very suggestive of typhoid fever. J. H., aged 40, drayman, a large well built man, was admitted, May 13th, with pneumonia. He had been a pretty healthy man, though he had had two previous attacks of inflammation of the lungs. He had been in the habit of taking stimulants. His present illness began on the 11th with the usual symptoms of influenza. The blood pressure of 122/68 Blackader. On admission, he was delirious; temperature 105°; respirations 60, pulse 110, consolidation of lower two-thirds of right lung, with the usual physical signs of perspiration. On the 6th day, the delirium was less marked and the temperature had fallen to 101.5°. On the 9th day, the fever was 103°, and the condition of lung remained about the same. On the 12th day, I saw him with Dr. Molson. The delirium appeared to be diminishing at the right base; I could hear no murmur at either apex or base of heart. The patient resembled closely other cases of pneumonia in which ulcerative endocarditis had developed, and I suggested the possibility in this instance. The tongue was furred; no abdominal distension; no spots; diaphoresis had come on in the past few days; stools thin, yellowish and offensive. The patient had been delirious. On the 18th day, temperature rose to 104.5°, and for the next four days kept about that height. On 20th day, diaphoresis, which had been checked, began again. On 23rd day (June 1st), temperature 104.5°, pulse 98, respiration 30. Dulness diminished at right base, still evident in scapular region at lower part; moist râles over back of lung; rhonchi, sibilant and sonorous, heard in front. A single large dose (30 grains) of quinine, at 4 p.m. did not affect the temperature, which at 10 A.M. was 105.5°. On 26th day, much the same; temperature had kept about 104°; two or three loose stools each day; low delirium, restless at night. For the next three days, the fever was not quite so high, the diaphoresis ceased, and he became somewhat rational. Still deficient resonance in right lung behind. Respirations kept about 30, and pulse, about 100, during the day. The patient was very restless, required constant watching; temperature 104.5°; pulse more rapid, 100. On the 10th, patient more drowsy; pulse feeble, 140; large moist râles heard over both lungs. In the evening he had a rigor; temperature rose to 105°, and death took place on the morning of the 11th, just a month from the onset of the disease. Petechiae had appeared on the skin during the last few days of his life.

Necropsy, five hours after death. The body was not macerated; there were petechiae on the skin in various regions. In the abdomen, patches of dark extravasation were noticed upon the coils of intestines, both large and small. In the thorax, the right lung was intimately adherent. Heart, subpericardial ecchymoses. Numerous petechial spots beneath lining membrane of the cavities; some of them as large as split peas, and well rounded, present a greyish-brown consolidation, with small infarcts. The mitral segment were natural-looking on the ventricular surface, but on separating the edges, large masses of vegetations were seen blocking the orifice. They were attached to the auricular faces, about 2 to 3 millimetres from the edge; that in the anterior segment was about 2 centimetres in extent, and projected 12 millimetres. It was roughened on the surface. The growth on the posterior segment was surrounded by a narrow white and yellowish mass, which extended to the posterior segments, the surfaces of which were smooth. The aortic orifice was blocked with a clot; the right anterior valve presented an enormous mass of vegetation, which occupied the entire cusp, except the edge, and infiltrated the whole thickness, appearing in the sinus as small nodular masses. Two perforations existed between the outgrowths, each about the size of a crow-quill. The posterior segment presented a flattened vegetation, which encroached the centre of the valve, and extended up to the corpus Arantii. All of these masses had the same appearance; colour greyish-yellow, except where coated with adherent blood-clot; the ones on the anterior mitral segment and on the posterior auricular were roughened, and the granular substance exposed; three others presented smooth surfaces, as if covered by a thin membrane. They were soft, on section granular, uniform throughout, and free from the consistency of the lungs. Lungs. The right was closely bound to the chest-wall by old fibrous adhesions. The posterior part of the organ was heavy, but crepitant, except at the upper part of the lower lobe, which, with a band about 5 centimetres in breadth, of the lower part of the upper, and part of the middle lobes, were firm, aerial, and granular on section. Colour liver-red, interspersed with yellow and green. The coronary arteries were free. The left lung healthy. The spleen weighed 185 grammes; pulp soft. No infarctions. The kidneys were of average size; numerous small infaracts, chiefly in cortex; small hemorrhagic areas with grey centres. Intestines. The deeply ecchymotic patches seen externally corresponded with small infarcts situated in the submucous tissue, and surrounded by the mucous membrane, above which the grey pale glandular layer could be distinctly seen. The infarct itself was about the size of a split pea, a little elevated, on section deep red or greyish red, not in any instance purulent, and surrounded by a zone of extravasation from 1 to 3 centimetres in diameter. They were most abundant in the ileum, about 20 in number. Feyer's glands were not swollen. The liver was a little enlarged, a little yellow, its parts at base and edges normal. Thick purulent lymph beneath arachnoid, covering central part of fissures of Sylvius on both sides, over both frontal lobes at anterior part, over the left intraparietal fissure and on upper part of cerebellum, close to great transverse fissure. A good deal of serositis beneath the membranes. No infarcts in substance of brain.

In some instances, the clinical features are mixed; typhoid and pneumonia alternate, as in the following case.

J. B., aged 38, admitted January 7th, 1880, had been a healthy man. Ten years ago, he had a severe attack of pneumonia. On the night of January 4th, he felt uneasy, and did not rest well; got feverish, and in the morning had pain in the side and cough. No rigor. Symptoms continued, and he came to Hospital on 7th. On admission, no rigor; pulse 128, and respirations 40. Signs of pneumonia in right lung, lower three-fourths. Characteristic expectoration. During the first week in hospital, nervous symptoms appeared; he became delirious, and passed urine and feces in bed; tongue dry; and on the 9th and 10th there was troublesome vomiting. The temperature was irregular, ranging from 100° to 104°; the evening record usually high, but twice it was lower than the morning. Pulse 120 to 148; respirations 32 to 50. During the second week, the intensity of the symptoms abated; the temperature kept lower, not once reaching 101°. The nervous prostration continued, with tremor of whole body, and the discharges were passed involuntarily. Tongue very dry. A very disgusting factor emanated from the body. He lay like a patient in the third week of severe fever; took food well, and in a month was able to move about. Petechial swelling appeared in the left parotid region, and he began to have chills, and sweated a great deal each day. No objective indications of heart-trouble. The lung cleared very much in the third week, but the prostration continued. During the fourth week, the swelling of the parotid increased, and on February 1st an abscess was opened in this region. On 30th, there were severe chills, with blueness of face and the finger-tips. Much sweating, of a profuse drenching character. He became brighter after the abscess was opened, and the nervous symptoms were less marked. Temperature ranged from 98° to 100°, rising with the chills. In the fifth week, he remained in this state, with but little change, occasional chills and profuse sweats, the picture being more like severe pyemia. In the sixth week, the temperature increased, and he lay in bed with chills, with profuse sweats, but most profuse sweats. On February 13th and 14th, the temperature rose very high, reaching 105°, and death took place on the 15th, after an illness of forty-two days.

The necropsy revealed extensive mitral endocarditis, as the only special lesion. The base of the right lung was a little firmer than the left, but not granular on section, but a very large amount of frothy serous fluid was found, which filled the lower and part of the spleen. The intestines were healthy; there was no menigitis. The parotid abscess had almost healed.

Cardiac Group.—Under this heading may be arranged, as suggested by Dr. Bramwell (Diseases of the Heart), those cases in which patients, the subjects of chronic valve-disease, are attacked with febrile symptoms and evidences of a recent endocarditis engrafted on the old process, in which the changes are found in connection with sclerotic endocarditis. Many of such cases present features of the pyemic, typhoid, or cerebral types,
and may be of the most acute character; but, in others, the process appears much less intense, and the cause more chronic. In a considerable series of cases, the history is somewhat as follows. The patient has, perhaps, aortic valve-disease, and is under treatment for failing compensation, when he begins to have slight irregular fever, an evening exacerbation of two or three degrees, some increase in cardiac pain, and a sense of restlessness and distress. Embolic phenomena may develop; a sudden hemiplegia; pain in the region of the spleen, and signs of enlargement of the organ; or there is pain in the back, with bloody urine. In other instances, peripheral embolism may take place, with gangrene of the foot or hand. There may be hebetude or a low delirium. Instances such as these are extremely common; and while, in some, the process may be very intense, in others it is essentially chronic, and may last for weeks and months, so that the term malignant seems not at all applicable to them; still, in a large series of cases, all gradations can be seen between the most severe and the milder forms. Dr. Green (Lancet, 1884, vol. i) referred to a case which lasted six months, and to another in which, during eighteen months, there were attacks of irregular fever. I have known the febrile symptoms subside for weeks, to recur again with increased severity; and there are cases which render it probable that the process may subside entirely. The ulcerative destruction, in these cases, may be most extensive; and I have seen the aortic ring with scarcely a trace of valve-substance left. The process in the chronic cases is also myotic, and it is to be carefully distinguished from the atheromatous changes. In very many instances, there is no history of rheumatic fever or of other constitutional disorder; but the endocarditis appears to attack the sclerotic valves as a primary process, and a very considerable number of the most typical cases are of this kind. A good example was the following case, in which the disease attacked a perimyocardium, and the clinical symptoms were prolonged for nearly three months.

H. M., aged 38, was admitted September 8th, under Dr. Ross. He had a good family and personal history; he had always enjoyed excellent health. A month ago he had chilly feelings, fever, and sweating, with vomiting. He kept about until ten days before admission, when he took to bed, with pains at the heart, and fever. On admission, there was marked aortic incompetency; temperature 100° Fahr.; he seemed dull and heavy. On 15th, there was illiac tenderness, and some diarrhoea. For the next two weeks, he remained in same state, temperature rising at times to 103° Fahr. During the first week of October, the prostration increased, and there was slight delirium at night; temperature not higher than 102° Fahr. On the 14th, there was an eruption of petechiae. From this time, the temperature kept lower—100° to 101° Fahr. — the delirium and prostration increased, and death took place on the 23rd. Two of the aortic cusps had fused, and there were old sclerotic changes; there were recent soft greyish vegetations; the spleen presented six or eight infarcts, one supplicative.

These are the cases of ulcerative endocarditis which present fewest difficulties in diagnosis. The existence of the chronic heart-disease excites attention; and even if compensation has previously been perfect, the ulcerative process may be the very cause of disturbing the balance and producing marked symptoms. In my experience, the existence of fever is invariably when the ulcerative processes are due to micrococci, whereas most extensive destructive changes may occur in atheromatous disease without any elevation of temperature. It may be possible that the granular detritus discharged from atheromatous foci on the valves, or on the aorta, may have irritating properties; yet, in two instances, I have met with most extensive atheromatous ulcers on valves and aorta, from which large quantities of material must have been discharged, and the patients were not febrile. Dr. Sansom (Lancet, 1884, vol. i), however, has referred to a case of ulcerative endocarditis in which there was no elevation of temperature throughout.

Cerebral Group.—A considerable number of cases of malignant endocarditis come under observation, perhaps, in hospital-practice, for the first time, with symptoms of cerebral, or even cerebro-spinal, trouble. In three of the Montreal cases, the patients were brought to hospital unconscious, and presented the appearance of profound cerebral affection. One of the first cases I saw was of this kind. The patient, a woman, aged 29, was admitted on October 22nd in an unconscious state, and no history could be obtained. On the 24th, she became partially conscious, and complained of great pain in the head and back of the neck. Symptoms of slight apex-pneumonia were detected. Temperature up to 104°. On the 25th, she passed urine and feces involuntarily. There was strabismus of the right eye, and commencing ulceration of the left cornea. Death took place on the 26th. The symptoms were those of an acute meningitis. The post mortem examination revealed apex-pneumonia, a patch of endocarditis on the aorta, and suppurative meningitis, involving chiefly the cortex. Another case, almost the counterpart, was admitted last year, under Dr. Molson, in an unconscious state, and died eighteen hours after admission, when the necropsy revealed apex-pneumonia, extensive endocarditis, and suppurative meningitis. There may be early unconsciousness or delirium without any meningal implication, as in a case of primary endocarditis admitted June 5th, 1881. The patient may be wildly delirious or unconscious at the first visit of the medical man, as in a case narrated by Eberth (Virchow's Archiv, Band 14). Very many of these cases die within two or three days of admission, and the question of diagnosis has usually to be suspended; indeed, in looking over the records of eleven instances in which these cerebral symptoms were early, they appear to run a more rapid course than other cases.

In two remarkable cases, there was cerebro-spinal meningitis. Hunolle (Bulletin de Soc. d'Anatomie, 1879) records a case of a lad who was admitted with symptoms at first like those of typhoid fever,
and then a marked cerebro-spinal character. There was also a pulmonary affection and endocarditis. The patient lived five days. At the necropsy, there were suppurative meningitis of the brain and cord, pneumonia of one lung, and extensive ulcerative endocarditis, with old sclerotic changes.

In a case of Dr. Croyer's (Lancet, 1884), there was a mottled red rash on the skin. Colson (Bull. de Soc. d'Anatomie, 1876) describes a case in which the rash was erythematous, and in spots distinctly papular.

The mental symptoms may be of a very varied character. By far the most frequent conditions are low delirium, and a dull, semi-conscious, apathetic state. There may be at the outset active delirium, or even mania. In a case described by Guy's Hospitals Reports, vol. xvii., there was a condition described as mental eccentricity. When there is extensive meningitis, there is usually a condition of deep coma.

Sweating is a very frequent symptom, and is worthy of special notice, from the peculiarly drenching character, which is, as Dr. Henry Thompson remarks (Lancet, 1880), seen not far beyond the average mark of phthisis or pyemia.

The diarrhoea is not necessarily dependent on any recognisable lesion, and may be not very marked, even when the infarcts on the mucosa are most abundant. As noted in several of the cases, it may be profuse, and still further add to the resemblance which some of the cases bear to typhoid fever.

Jaundice may be present, but appears to be a rare symptom. Cases, some of which were mistaken for acute yellow atrophy, are reported by Schnitzler (Wien Med. Presse, 1885), Gubler (Giuseppe Medicale, 1862), Luys (Ibid., 1864), and Mattics and Chavlet (Ibid., 1862).

The heart-symptoms may early attract attention, from the complaints of pain and palpitation; but, as a rule, they are latent, and unless looked for are likely to be overlooked. In those cases with chronic valvular disease, there is usually no difficulty, but where the affection sets in with marked constitutional symptoms, the local trouble is very apt not to attract attention. Even on examination, there may be no murmur present, with extensive vegetations, or it may be variable. There are many instances on record, by careful observers, in which the examination of the heart was negative.

The course of the disease presents many variations, well illustrated by the records I have given; very acute cases may run their course within the week, as in the patient Ann O., already referred to, while in others the duration may be even two or three months. Except in certain cases in which the patients are the subjects of chronic valvulitis, the course is rarely prolonged beyond four or five weeks. Some of the pyemic group, particularly those with intermittent pyrexia, appear very prolonged, even two or three months. The most rapidly fatal case is described by Eberth (Virchow's Archiv, Band xivii.), in which a man, who had enjoyed previous good health, was attacked on the evening of the 25th, with rigors, followed by high fever and rapid unconsciousness. The temperature that night, when seen by a physician, was 41° C., and the case seemed like one of typhus fever. On the 27th, he was removed to the hospital, where he died at 5 p.m. The temperature was 42.4° C. There were extensive ulcers in the aortie valves, and suppurative infarcts in the brain. The duration in this case was scarcely two days. In a considerable number of instances, the disease terminates within a week or ten days.

**The Mortality in Indian Gaols.**—It appears, from a recent Report, that since 1878, the year following the last famine, there has been a steady decrease in the gaol population of India—from 127,914 to 94,083. There has been an improvement in the health of prisoners as a whole; but it is admitted that in several gaols the range of sickness and mortality still continues very high. The most unfavourable return is from the Central Provinces, where the rate of mortality rose from 28.50 to 71.05 per thousand. This extraordinary increase is attributed to "the general unhealthiness of the country, and to the transference to the Raipur gaol of a number of prisoners from the feudatory State of Kalahandi, a people who are reported to be by habit and temperament utterly unable to bear the loss of freedom and separation from their families." The returns from certain gaols are still much worse than those from the different provinces. There are still 12 gaols where the rate of mortality exceeds 10 per cent., and that at Mymensingh shows the extraordinary rate of 27 per cent. There appears to be no neglect on the part of the official authorities, and in consequence of the criticism which the facts have aroused against our gaol administration, the most trivial cases are sent into hospital. This has not been devoid of satisfactory result; and the decrease in the cases of fever, malarial, and dysentery is specially noticeable.

Dr. Haslam, the British Burmah, and British Burmah served to make a general diminution of the rate for the whole of India of about 4 per thousand. While the subject is still engaging much of the attention of the Indian Government, there seems no doubt that the high mortality is due, not to any official remissness, but to the prevalent epidemics of cholera, which are necessarily peculiarly fatal among men who seem to be excessively sensitive to the irksomeness of imprisonment.
THE GULSTONIAN LECTURES,
ON
MALIGNANT ENDOCARDITIS.
Delivered at the Royal College of Physicians of London, March, 1885.

By William Osler, M.D.,
Professor of Clinical Medicine at the University of Pennsylvania, Philadelphia.

LECTURE III.

Diagnosis.—Few diseases present greater difficulties in the way of diagnosis, difficulties which in many cases are practically insurmountable. It is no disparagement to the many skilled physicians who have put their cases on record to say that, in fully one-half of them, the diagnosis was made post mortem. In spite, too, of able memoirs in the journals, the disease has not been much known, and it is only of late years that the textbooks have contained chapters upon it. The protean character of the malady, the latency of the cardiac symptoms, and the close simulation of other disorders, combine to render the detection peculiarly difficult.

In the group of cardiac cases in which the disease attacks a patient the subject of chronic valvulitis, the matter is usually easy enough. The existence of fever of an irregular type, and the occurrence of embolism, generally suffice to make the case clear. It must be remembered that simple warty endocarditis not unfrequently attacks sclerotic valves, and may be accompanied by slight fever. Of course, in chronic heart-disease, irregular pyrexia may arise from other causes—local suppuration, cellulitis, etc.—which must be excluded.

In rheumatic fever, a disease in which the heart is more systematically examined than in any other, with the occurrence of a murmur the symptoms become aggravated, and assume a typhoid or pyrnic type, the recognition of the complication should be easy. The onset of severe head-symptoms in rheumatism—delirium, with high fever and coma—requires to be carefully distinguished. Fortunately, the simple endocarditis is here rare, as I shall have occasion to show, passes into the grave form.

In pneumonia, a prolongation of the course, with the superinfection of typhoid or septic symptoms, should lead to a very careful examination of the heart.

The greatest difficulty is met with in those acute cases resembling the malignant forms of the fevers; here the affection may simulate typhoid, typhus, cerebro-spinal meningitis, or even hemorrhagic small-pox. Even with the detection of a heart-murmur, the judgment may have to be suspended for many days by the general symptoms of profound blood-poisoning, before the development of any special features upon which a diagnosis could be based.

From typhoid fever, with which the cases are most often confused, the mode of onset, the pyrexia, and the abdominal symptoms offer the chief points of distinction. The onset of severe endocarditis is more abrupt, not so often preceded by a period of failing health and progressive weakness. In a large number of cases, cardiac pain or oppression and shortness of breath are mentioned as early symptoms. The fever rarely presents, in the early days of the disease, the regularity of typhoid, and from the outset may be very high. A sudden fall to the normal, or even below, may occur; indeed, irregular pyrexia is one of the most important diagnostic signs. The combination of diarrhoea, abdominal distension, and a rose-coloured eruption, points strongly to typhoid fever. The rash, when present, is usually petechial, a rare circumstance in typhoid fever. The development under observation of pronounced murmurs, particularly of aortic and regurgitant, is most suggestive of malignant endocarditis, and the occurrence of emboli would be a positive confirmation. Rigors rarely occur in typhoid fever, while they are common in endocarditis. It is well, however, to bear in mind that, in many of the most severe cases, death may occur, as in any of the infective disorders, without the development of the special symptoms necessary for a diagnosis.

Many of the cases present the clinical features of pyrexia, a condition which may actually exist, dependent upon the ulcerative lesions on the valves; and here the diagnosis lies between an ordinary septic infection from a wound, or auto-infection from a primary endocardial inflammation.

It is interesting to note the similarity of those cases of acute endocarditis in which death occurs in a few days, without the development of any other than the valvular lesion, with those instances of rapidly fatal acute pericarditis and necrosis, and also with those cases of malignant septic infection from a slight external lesion.

It seems strange that difficulties should arise in the diagnosis between malaria and malignant endocarditis, I have gone over records of 200 cases; plainly show that for weeks or months a condition of intermittent pyrexia may occur, simulating every type of ague. The paroxysms in regularity, in order of sequence, and in the accompanying general conditions, may fulfill every condition of the quotidian tertian intermittent; and the development of cardiac symptoms, with breathing of the pyrnic type, may alone determine the nature of the case.

Etiology and Pathology.—With a view of obtaining data upon which to base statements regarding the etiological relations of malignant endocarditis, I have gone over the records of 200 cases. As before stated, 37 of those occurred in connection with typhus, traumatic or puerperal. Doubtless this number could have been greatly increased had I examined files of special gynaecological and surgical journals, but my investigation did not lie so much in these directions. In 45 cases, there was no record of any previous disease which could be taken into account as possibly connected with the endocarditis. In 127 cases, there was a history of past or existing disease with which the cardiac trouble could, with a greater or less degree of probability, be associated.

One or two general considerations may first be mentioned. The period of middle life gives the greatest number of cases. Young children are rarely the victims; there were only three or four instances under 10 years of age, and not many more over 50. The cases occurring in connection with rheumatism present an average age younger than the others; there were 36 instances under 30 years of age, out of 51 cases in which this point was mentioned.

Oftentimes (exclusive of traumatic and puerperal), 99 were in males, and 61 in females. Persons debilitated by exposure or other causes, or addicted to drink, seem particularly liable to be attacked; and in such subjects, during the course of an acute disorder, this complication is much more likely to arise.

It has been already referred to, the existence of sclerotic valvularism is a very important factor in the etiology of severe endocarditis, a very considerable proportion of the cases occurring in individuals whose valves are thickened and crumpled from chronic inflammation.

The existence of a primary protopathic endocarditis must, I think, be considered. In 46 cases, no history could be obtained of rheumatism or other affections with which endocarditis is known to be associated. Many of these cases were of the most malignant type; in 10, death took place within a week. A specific statement of the absence of rheumatism was generally given. The onset was usually like that of a diffuse headache, vomiting, rigors, pyrexia, and often early delirium and unconsciousness. The very acute cases resemble severe typhoid or typhus, but, when more prolonged, a pyemic condition may develop. In a number of these cases the disease has attacked persons with a history of rheumatic attack for several years, in whom the compensation was complete and the old lesions only detected at the necropsy. In 5 instances, the ulcerative process attacked aortic valves, 2 of which were fused, and had undergone the fibroid changes always associated with this malformation.

In 127 of the cases, the endocarditis was associated with other diseases, some of the most important of which we shall now proceed to consider.

Rheumatism.—Since Bouillaud called special attention to the frequency of cardiac complications in this disease, its importance in the etiology of endocarditis has been universally recognised. And, as regards the simple form of endocarditis, the general statements are quite true, but, fortunately, the grave and fatal form is much less common, much less, I think, than is usually supposed. In 53 cases, there was a history of rheumatism, past or present. I included every case in which there had been the record of an attack, recent or remote. In only 24 did the symptoms of severe endocarditis arise during the progress of the acute or sub-acute disease. In 29 cases, there was simply a history of rheumatism, often years before, and no mention of the occurrence of joint-troubles at all; but the remote influence of the endocarditis. Dr. Ogle called attention to the fact that ulcerative endocarditis occurred very often in persons in whom no rheumatic history could be traced. Of 21 cases which he reported, some of which were probably atheromatous, in only 3 was rheumatism mentioned. A study of the Montreal cases also shows the same history of rheumatism, either before or during the attacks. Since this case, under the care of Dr. Ross, is a good example of the mode of onset.
rheumatism of the wrists and ankles, not very severe, and she did not receive any treatment. A week from the beginning of the attack, she began to have chills, two or three a day. During the course of the second week she became chills, not delirious; she was brought to hospital on the 4th, in a very low state. On the 5th there was delirium and incoherence. Pulse 130; temperature 108°. On the 6th, the temperature was 104°. Double murmur up and down sternal; joint-troubles not well marked. On the 7th, 8th, and 9th, the patient had had a temperature of 100° to 102°. On the 9th, she was more restless. On the 11th a grey membrane was noticed on the fauces. On the 12th, the membrane in the throat had extended, and covered the soft palate. Temperature 105°. On the 13th she died suddenly. The necropsy revealed a large deep ulcer, destroying a large portion of the larynx. The usual deep ulceration of the aortic ring and the left ventricle. There were small infarcts in the brain, extensive recent effusion of the fauces.

In a larger number than in any other group, atheromatous valves were found, with the existence of which the past rheumatism could, in many instances, be connected. A primary rheumatic endocarditis was recognised by Latham, also by Graves and Stokes, and it is quite possible that some of the cases which I have grouped as protopathic represented instances of the kind in which, if life had been prolonged, joint-troubles might have supervened.

Cases of acute rheumatism sometimes occur in which there may be multiple mililiary abscesses (Fleischhauer, Virchow's Archiv, Band lxxiii), and a pyemic condition similar to the case just narrated, but without the presence of endocarditis. Micrococci have been observed in the case, and the occurrence of rare instances of idiopathic pyemia. It is worthy of observation that a skin-eruption was most frequently noted in connection with the rheumatic cases, generally an erythema. In a case of Dr. Kirkos (British Medical Journal, 1885, vii), it was observed on both face and hands. The occasional occurrence of a scarlet rash with pneumonia (Pekel, Union Medicale, 1870), and in purpural fever (Hicks, Obstetrical Society's Transactions, vol. xii), has long been recognised.

In the cases with which simple endocarditis is so often associated, the malignant form very rarely supervenes.

Pneumonia, as Boulle pointed out, is not uncommonly complicated with endocarditis, but the important part which it plays in the etiology of the malignant disease has not been generally recognised. In the cases I have reviewed, it stands at the head of the list of diseases in which secondary endocarditis of a severe nature develops, 54 instances having been noted, rather more than 25 per cent. of the total number of cases. For this I was quite prepared by our Montreal experience, for, in 11 of the 23 cases, the attack was associated with pneumonia. Of the occurrence of acute endocarditis in this disease, the statements are somewhat diverse. Boullaud thought that, in a third or fourth of the cases in which there was left-sided pneumonia, there was an infarction of the pulmonary membranes. Grisolle, in his classical work on pneumonia, states, on the contrary, that it is a rare complication, and this would certainly appear to be the conclusion of the Committee for Collective Investigation; for, in the report upon 1,000 cases, endocarditis is only once mentioned. My experience at the Montreal General Hospital is very different. I have notes of 103 post mortem on cases of lobar pneumonia, and the occurrence of acute endocarditis is noted in 16 cases, over 10 per cent. Of these cases, 11 were of the malignant form. An analysis of these shows that, in 6, the left lung was involved; in 5, the right; in 4, the upper lobe was affected; in 7, the lower. In 9 of the cases was there pericarditis; in 5 of the 11 cases, there was suppurative cortical meningitis. In the 54 cases which I have reviewed, in 36 the lung affected was mentioned, and in 26 the affection was on the right side, and only 10 on the left; figures which are opposed to the statement of Boullaud. The inference is that it is in left-sided pneumonia most frequently supervene. In 15 cases, acute meningitis is mentioned, and, in one instance, the meninges of the spinal cord were also affected. The aortic valves seem more often involved than the mitral. In 17 instances, there were old sciotic changes in the valves.

The clinical features of several cases in which the endocarditis came on during pneumonia have already been given. In many of them, as in the girl, M. D., aged 29, referred to in the second lecture, the patients are brought to hospital unconscious, and die within a few days with the symptoms of a grave cerebral disorder. There is a history of ordinary pneumonia, and the case may pursue the usual course, and defervescence take place, when, in a day or so, fever of an irregular type recurs, and typhoid or pyemic symptoms appear. The majority of the cases are of this kind. Again, some instances occur in connection with injuries, and the patient accords to a lobar pneu-

monia and endocarditis unconnected with any sepsis. Two of the Montreal cases were of this kind. In three or four cases, there were rheumatic symptoms preceding the pneumonia, as in the case of Dr. Mussers, the remarkable temperature-chart of which is here shown.

Elderly persons were more often attacked than in the other groups. There were 10 individuals over 50 years of age. In the Montreal cases, of the patients had pneumonia before; in 1 it was the third attack, and in every one of them there was a history of either drinking habits or previous bad health. In some cases, the pneumonia had partially or entirely resolved at the time of death, in others there was red, or, more frequently, grey hepatisation.

In some of these cases, pneumonia had been complicated with the pneumococcus, and the endocarditis is particularly interesting. The occasional occurrence of this complication in pneumonia has been reported by many writers, particularly Grisolle, Huguenin (Ziemens's Encyclopaedia, Band xii), and Greenfield (St. Thomas's Hospital Reports, 1875). In the 103 cases, I met with 8 instances, 5 of which there was also endocarditis. The frequency of the association of these two conditions in pneumonia is illustrated by the figures already given: of 25 instances of meningitis in malignant endocarditis, 15 cases occurred in pneumonia. In all the specimens I have examined, there were micrococci in the exudation, and in three cases many of the capillaries and small arteries were filled with them; and it seems natural, where the endocardium is involved, to attribute the process to embolism from the valves. But the occurrence of an identical cortical meningitis without any valvulitis shows that it may be due to other causes than the bacteria. As Huguenin suggests, it may be dependent upon the presence in the blood of infective material derived from the infil-

trated lung-tissue.

In connection with these secondary or consecutive inflammations in pneumonia, it is interesting to call to mind the not infrequent occurrence of an endocarditis, of a pyemic nature, in the gastro-intestinal canal. Dr. Brisseau a few years ago noted the frequent complication of septic colitis; and, in 103 necropsies, I have met with this complication in 8 instances; and in one there was extensive septic or membranous gastritis.

When endocarditis is present, and I have only been able to find two or three instances in which severe symptoms were present; yet, in some works, endocarditis is stated to be not an uncommon sequence. Labadie-Lagrave (Bulletin de la Soc. d'Anatomie, 1877) regards it as such; but it is probable that what he described as vegetations are only Allini's little nodules, the remnants of foetal structures. In 103 necropsies in diaphtheria, Talmon (Progres Medicat, 1879) did not meet with a single case of endocarditis; and my experience has been the same in 30 post mortem examinations, many of which were in adults.

In dysentery, a few cases have occurred. Litten (Charité Annalen, Band iv) recorded an instance in which there was extensive ulceration of the aortic valves; and one of the Montreal cases occurred in connection with acute colitis.

In the erysipelas favus, grave endocarditis occasionally develops—in typhoid, in scarlet fever, and in small-pox; but, in the cases I have collected data from the Montreal General Hospital, there is very little of any trival etiological significance.

In aque, as Lancer eaux ( Gazette Medicale de Paris, 1862; Archives Generales, 1872) first pointed out, simple or severe endocarditis may develop. In some of these cases, as in the memorable one reported by Dr. Brisseau, to which I referred in the second lecture, the paroxysms of true intermittent fever, and those of the ulcerative endocarditis, seem to run the one into the other. In most of the cases, there has been only a history of severeague, and the endocarditis has followed repeated attacks. Dr. Greenhow (Pathological Society's Transactions, vol. xxx) has reported a very instructive case of the kind.

Pathology.—I approach a discussion of the pathology of malignant endocarditis with some trepidation, partly due to a sense of incompetency, and partly from a feeling that the time is scarcely ripe for a satisfactory presentation of the subject; yet there are signs which make one think that ulcerative endocarditis is more frequently met with at periods in which scarlet fever, erysipelas, pneumonia, and diaphtheria prevail. The Guy's Hospital records certainly seem to show that the cases appear in groups pretty close together, and at a time when the diseases mentioned are epidemic. In Montreal, we have had occasiona lly a "run" of cases together; but I have not noticed the connection referred to by Dr. Goodhart.

1 Dr. Brisseau informs me that, in the case referred to, he is inclined to regard the intermittent pyrexia as dependent from the outset upon the endocarditis, and not associated with malaria.
hopeful; and it would not be rash to predict that the knowledge twenty-five years hence will be as much in advance of to-day as our information on the subject is of the time when Dr. Kirke made his memorable investigations. A serious difficulty in the thorough study of the disease is that we have not to deal with a single form of disease—an entity—but rather with a special manifestation in many affections; affections, too, the pathology of which is, in most instances, by no means clear. Nevertheless, we can doubt that the more severe cases of endocarditis present in a typical manner the factors and phenomena which we call infective, and believe to be caused by the absorption of some poison, the development of which in the blood and tissues profoundly disturbs, and finally annihilates, function.

The theory of endocarditis, which at present prevails, and the only one to which I shall refer, is, that it is in all its forms, an essentially myotic process; the local and constitutional effects being produced by the growth on the valves, and the transference to distant parts of micrococci, which vary in character with the disease in which it develops. This attractive theory can be adjusted to meet every requirement of the case, though we are yet lacking certain of those substantial data necessary for full acceptance, but which, having been furnished of late years in other diseases, we may reasonably hope will in time also be forthcoming for this.

Let us see, first, what has been done, and, how far the facts at our disposal seem favourable to this view. The constant presence of micrococci seems undoubted; only, in the simple acute form, we need more careful observations with our improved methods. Some good observers have not been able to find them (Orth, "Lehrbuch der Spezifischen Pathologie," Band vii, 1883) (Klebs, Archiv für Exper. Pathologie, Band iv; Köster, Virchow's Archiv, Band lixxi.)

The careful application of such a satisfactory mode of staining as recommended by Gramm should readily determine this question. A study of the endocarditis, and myotic phenomena in general, would be most likely to yield important information, as here the conditions are simpler, and the relation of the micrococci can more readily be determined. The cardiac complications in these cases is only part of a general process, excited by a local lesion, and is entirely secondary and subsidiary. Micrococci arranged in chains and forming the con- stituents of the vegetations, and, in the case of puerperal fever, they have a close resemblance to those found in the peritoneal exudation. The well-known observations of Koch, Ogston, and others, have shown the relation of micrococci to pyemia; and the recent culture-experiments of Rosenbach ("Micro-organismen bei den Wund-Infections; Krankheiten des Menschen, Wiesbaden, 1884") go far towards demonstration for what we know that Koch had previously done in the case of the pyemia of the mouse. In these cases, a study of the modes of growth of the micrococci of the endocarditis, and of the effects of inoculations, and a comparison of the results with similar experiments in the growth of the original lesion, or of the metastatic focus, should yield results of great value in the interpretation of the phenomena of secondary endocarditis.

In rheumatic fever, we are still too far from any accurate knowledge of its intimate pathology to dwell on the possible connection of any organism peculiar to it, and the endocarditis common in its course. Klebs (Archiv für Exper. Pathologie, Band iix) distinguishes the micrococci occurring in rheumatic cases from those of the septic forms. In pneumonia, micrococci undoubtedly abound in the exudation of the air-cells, and their mode of growth in gelatine is peculiar, but the numerous experiments on artificial production are not yet conclusive. The evidence is accumulating which places pneumonia among the infective disorders; and it certainly is a seductive view to take of its pathology to regard the local pulmonary lesion as excited by the growth of micrococci in the adjacent parts, the consolidation, inflammation, the endo- and peri-carditis, the pleurisy, the meningitis, the membranous gastritis or colitis, as due to the penetration of the organisms to deeper parts, and their local development under conditions dependent on the state of the tissues. The processes are all of the character described as croupous, and have as common features the presence of micrococci in a coagulable exudation. We have still, however, to settle the identity of the organisms of the air-cells with those of the consequent infections; but we may reasonably hope ere long to have some positive data from investigations in this disease, which, more than any other, offers favourable opportunities for the solution of these problems.

In diphtheria, as we have seen, myotic endocarditis rarely occurs; and, in the few instances observed in association with scarlatina, variola, erysipelas, and other affections, we lack positive information with regard to the characters of the micro-organisms.

In the way of experimental investigation of the properties of the micrococci, not much has been done of a satisfactory nature. Heiberg (Virchow's Archiv, Band i) placed bits of vegetation from a puerperal case beneath the skin and in the peritoneal cavity of a rabbit without sterilising them. A similar experiment (loc. cit., Band xvii, kunde) has produced panophthalmitis in the rabbit by inoculating the cornea; and I was able to produce well marked myotic keratitis in the same animals with fresh material from the valves of two cases. H. Young, of Manchester, inoculated rabbits with pus from an ulcerative endocarditis, and was able to detect micrococci in the blood.

No conclusive culture-experiments have yet been made. Grancher (Journal de Medecine de Paris, December 20th, 1884) has cultivated a microbe from the blood, taken during life with all necessary precautions, but not in series, and no inoculations of animals were made. Corinl (L'Acceuil Médicale, December 22nd, 1884) has made cultures on gelatine, but apparently no special results have been reached.

How do the micrococci reach the valves? In cases of puerperal and traumatic septicaemia, the external lesion is undoubtedly the source of infection which is conveyed through the venous system; and, in these cases, it will be remembered that the right heart is most often affected. In other instances, where the skin is unbroken, we must suppose them to gain access by the lungs or intestines, most probably the former, and, in these instances, the left heart is the chief seat of the mycosis. Whether they reach the valve with the general blood-current, as Klebs supposes, or through the coronary arteries, as Köster holds, cannot be considered settled; but, from the position of the early vegetations in a non-vascular region of the valves, and from the position referred to, it seems probable that the micrococci can be carried directly upon the endocardium, it seems probable that Klebs's view is the correct one. He suggests, in explanation of the fact that the lines of closure of the valves are the usual seat of the process, that the micrococci, circulating with the blood, are here closely pressed against the endocardium by the firm apposition of the flaps. Whether or not in any given case endocarditis will arise, depends greatly on the condition of the valve-tissue. In a case of pneumonia or other disease—such as pyemia—in which we may suppose microbes circulating in the blood, the endothelium of normal valves may be able to resist the infection, or, even if it be destroyed, the conditions may not be favourable for their growth; but, where an individual is debilitated, and the tissue-tone lowered, or if, as often seems the case, the valves be diseased, then the micrococci find a suitable niinus, and, excited, by their growth, an endocarditis which may be of a malignant type. As Dr. Goodhart suggests (loc. cit.), patients with chronic acroterial valves are walking mushroom-beds, in common times without spawn, but in periods of epidemics taking in germs by various channels, which fertilise in some cases into ulcerative endocarditis; in others, to supportive processes. Certainly, on the whole, the view we have so far set forth and from which we, directly or indirectly, have derived our present view, seems plausible enough, and meets the requirements of the case fairly well; but let us, in conclusion, follow an important rule too much neglected, and get a definite outline for our ignorance.

In the first place, we do not yet know, with sufficient accuracy, the local occurrence of micrococci in simple endocarditis. Are they constantly present, or only in forms associated with special diseases? Secondly, we want full information of the various forms of micro-organisms occurring in secondary endocarditis, and of their relation to the microbes assumed to be the cause of the primary disease. And, thirdly, we are only at the threshold of inquiries relating to the culture of these organisms, to the macroscopic characters of their growth, and to the possible experimental production of endocarditis.

An industrial exhibition for the working classes of East London will be opened by the Princess Louise on May 4th. The exhibition is a philanthropic scheme, and loans of works of art and other objects of interest are invited as well as subscriptions to the prize fund. The secretary is Mr. A. MacLagen, 506, Commercial Road East.

The third edition of Dr. W. H. Day's work on Heartache has been translated into the Russian language by Dr. J. J. Truevitch, Surgeon to the Russian Imperial Navy.